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ABSTRACT

The purpose of this research project was to evaluate the effects of prompts and cues in paired-associate learning. Experiment One was to investigate the effects of cues and prompting on the learning of Japanese vocabulary. Experiment Two duplicated the above using digit-nonsense syllable combinations as the paired associates. The next three experiments were designed to investigate the contributing effects of practice time to superiority of response prompting over confirmation in paired-associate learning. Experiment Six duplicated One and Two except that the first letter cues were provided both during the learning and recall sessions. Experiment Seven investigated the influence of mode of stimulus presentation, partial stimulus support, and length of item on short term memory. Although the facilitating effects of the prompting technique have received a great deal of attention, Experiments Three, Four and Five indicate that the advantage is primarily due to the additional practice time available with this method. In a second paper, subjects in two experiments learned lists of paired associates with or without prompting on first letter cues. In a third paper three experiments investigated the contributing effects of practice time to the reported superiority of response prompting over confirmation in paired associate learning. (Author)

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The purpose of this research project was to evaluate the effects of prompts and cues in paired-associate learning. The logic of the program is described in the original proposal.

In the studies cited here prompting refers to a set of experimental operations in which the learner makes no incorrect response during the learning of a paired-associate list. The correct stimulus-response connection is given on each training trial and the learner merely repeats the response term presented. Retention is measured during one or more test trials in which only stimuli are presented and the subject required to recall the correct response. This is unlike the usual confirmation method in which the stimulus is presented, the subject anticipates the associated response, following which he is provided with correct knowledge of results.

Methodologically, prompting appears to have an advantage because the learner makes no errors during training and the stimulus and response terms are connected closely in time. With classical confirmation, the subject often makes the wrong response, and a time interval separates the stimulus from the correct response. (The latter is presented during the knowledge of results period.)

Although the term "cue" has a number of connotations, it refers here to the presentation of the first letter of the response term. Whether the first letter is presented during learning as an aid to memory storage or as a crutch during memory search and subsequent recall is irrelevant.

The studies covered by this OED Grant were designed to investigate the above variables. The research included several pilot studies as well as the formal experiments described below.

Experiments I and II.

The purpose of Exp. I was to investigate the effects of cues and prompting on the learning of Japanese vocabulary. Experiment II duplicated Exp. I in all respects except that digit-nonsense syllable combinations served as the paired associates. This allowed a replication and test of Exp. I reliability with less meaningful material.

The methods and results of both studies were published as a single article and are described in the enclosed reprint "Influence of two guidance techniques on verbal learning." Data from both experiments indicated a superiority for prompting over confirmation, but no significant first letter cue effects.

During the course of this research program, the data of several pilot studies and of Exp. I and II indicated that some subjects used the interpair interval for rehearsal. Since the time between presentation of the response term of one paired associate and the stimulus of the next was longer for the prompt groups, it was hypothesized that the added practice time might be the factor providing prompting technique superiority. In consideration of the above, three experiments were designed to investigate the interpair interval variable.

Experiments III, IV, and V.

The interpair interval was manipulated in each of the three studies. The specific methods used and the resulting data are described in the attached reprint "Response prompting: The practice time variable." It is obvious that equating

the interpair interval for both prompt and confirmation groups eliminates the oft found significant difference.

Since prompting effects appeared to be confounded with available practice time during the interpair interval, further study of this variable was discontinued. The effects of first letter cues were pursued.

Experiment VI.

This study replicated Exp. I and II in all respects except that the first letter cues were provided both during the learning (storage) and the recall sessions. The data from this experiment have yet to be analyzed completely but it appears that cues do have an effect on learning with the influence being dependent upon the time of presentation of the first letter, i.e., whether it is presented during the storage period (learning), the memory search period (recall), or both.

Following the completion of Exp. VI, a series of pilot studies were carried out to determine the effects of first letter cues on short-term memory. These exploratory investigations resulted in the design of Exp. VII.

Experiment VII.

The purpose of this study was to investigate the influence of mode of stimulus presentation (auditory versus visual), partial stimulus support (first letter cues), and length of item (three or five letters) on short-term memory.

Forty subjects each were randomly assigned to either an auditory or visual condition. One half of each of the groups learned three letter nonsense syllables; the other half learned a five letter list. Within each subgroup, half of the subjects were presented with the first letter of the response term during recall, the remainder acted as controls.

The task for all subjects was to learn the set of eleven nonsense syllables. The letters were presented individually at a fast 0.5 sec. rate. So the total presentation time for a three letter item was 1.5 sec.; for five letters the time was 2.5 sec. Immediately following the presentation of the item (3 or 5 letters, one at a time), a three digit number was presented and S was required to count backwards by threes. This was done to control for any possible rehearsal effects. Five and one-half seconds later a buzzer sounded signalling the learner to stop counting and to recall the letters of the item just presented. Buzzer duration was 0.5 sec.; the number duration was 0.5 sec. For the cue conditions the first letter of the item to be recalled was presented immediately after the buzzer.

Analysis of the data indicated (1) a higher precentage of the letters correctly recalled with auditory presentation; (2) a higher level of correct recall for the cue groups; (3) and serial position effects across the three and five letter item positions. Obviously more three letter items were recalled correctly than five letter terms. It was also found that a confusion of acoustically similar letters contributed greatly to the errors made with visual presentation, and that the effects of proactive inhibition are noticeable as early as the second trial in both three and five letter lists.

The results of this study are now being prepared for publication.

Conclusions.

Although the facilitating effects of the prompting technique have received a great deal of attention, the results of Exp. III, IV, and V indicate that the advantage is primarily due to the additional practice time available with this method. Because of these confounded effects, statements made in a recent literature review by Aiken and Lau (1967) and a text by DeCecco (1968) concerning the applicability of prompting to programmed instruction require reexamination.

First letter cues do facilitate the learning of verbal material. However, the conditions under which facilitation occurs are as yet unclear. More research is needed to untangle the effects. The importance of using cues as learning aids is obvious, especially with children.

References

Aiken, E. G., and Lau, A. W. Response prompting and response confirmation: A review of recent literature. Psychological Bulletin, 1967, 68, 330-341.

DeCecco, J. P. The psychology of learning and instruction: Educational psychology. Englewood Cliffs: Prentice Hall, 1968. Pp. 501-512.

Influence of two guidance techniques on verbal learning[1]

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Subjects in two experiments learned lists of paired associates with or without prompting or first letter cues. Recall scores on interspersed test trials, and seven days later, indicated an expected superiority for prompting but no significant cue effects.

The experiments reported here deal with the effects of two types of guidance on paired associate learning. The first, prompting, refers to a set of operations in which the learner makes no incorrect response during training. The correct S-R connection is given on each training trial, and S merely repeats the response term just presented. Retention is measured during one or more test trials in which only stimuli are presented and S required to recall the correct response with neither stimulus support nor feedback. Although a relatively "easy" way to learn, prompting has proven superior to confirmation in a number of studies (Cook & Kendler, 1956; Cook, 1958; Cook & Spitzer, 1960; Reynolds, 1965, 1967; Sidowski, Kopstein, & Shillestad, 1961). Methodologically, this advantage has been cited as being due to (1) Ss committing no errors during training, and (2) S-R terms being connected closely or concurrently in time (Cook & Kendler, 1956). Anticipation methods, on the other hand, allow S to connect the wrong response to the stimulus, if he is incorrect, and provide a time gap between the presentation of the stimulus and correct knowledge of results. Unfortunately, prompting also allows more practice time, a fact left unmentioned in numerous studies to date.

Our second guidance technique, cueing, offers stimulus support by providing the first letter of the item to be learned during the response interval of each training trial. Obviously, if there is an advantage to this type of guidance, it should be most noticeable for the confirmation method where S is required to sustain a memory search on each trial before committing a response. However, it is possible that although storage is enhanced, retrieval is not because of the difference in stimulus conditions between training (cue present) and test (cue absent).

Method

In Experiment I Ss were instructed to learn a list of English words and their Japanese equivalents (Hepburn spelling[3]). All words consisted of four letters, but no term in either language list began with the same letter or ended with the same syllable. In addition, neither the English nor Japanese word of any pair began or ended with the same letters.

The Ss were subjected to nine training trials interspersed with recall tests on Trials 4, 8, and 12. Only the English word was shown on test trials and S required to write the Japanese equivalent with no feedback.

For the confirmation conditions, Ss saw the stimulus term (English), anticipated the response (Japanese), then received knowledge of results. Prompting groups saw the stimulus, then the response, and immediately wrote the response term just presented. Cue subgroups were shown the first letter of the Japanese term during the response interval.

Each word of the paired associate was individually flashed onto a screen at a 2 sec rate by a Dunning Animatic filmstrip projector. Ss were allowed 6 sec to respond; the inter-pair interval was 1 sec. On test trials, the stimulus was flashed for 2 sec, and 6 sec allowed for recall. Different random orders of the list were given on each training and test trial.

Seven days later, Ss were returned for an additional test. Only English words were presented, one at a time, and 20 sec allowed for each response.

Experiment II replicated Experiment I in all respects except for list content; the paired associates consisted of digit-nonsense syllable combinations. Single digits 0-9 were each assigned at random to one of the nonsense syllables. The latter were CVC trigrams of 25% association value (Archer, 1960). No two syllables began or ended in the same consonant.

Sixty different Ss with no formal training in Oriental languages and no experience in verbal learning research served in each experiment. They were students from introductory psychology courses at San Diego State College who received class credit. All were run individually, and assignment of Ss to conditions was random.

Results

Analyses of variance on total number of correct responses in both experiments indicated a significant superiority for prompting on each of the three initial test trials ($p < .01$) and seven days later ($p < .05$). These effects were due primarily to the larger number of extra-list intrusions ($p < .01$) for the confirmation condition; intra-list intrusions contributed no significant effect in either study.

There were no significant interaction effects, no difference in the number of first letters correctly recalled, and test trial performance for Ss trained with first letter cues was not significantly better than non-cue groups in either experiment. In fact, the mean numbers

of correct responses were consistently larger for the latter, with or without prompting. These results agree with data presented earlier (Greene & Sidowski, 1963).

Discussion

Of course it is tempting to evaluate the superiority of prompting within the framework of a mediation theory proposed by Cook & Kendler (1956) and propounded by Aiken & Lau (1967), but justifying such an interpretation would be most difficult. The prompting method, as operationally defined by Cook & Kendler and subsequently by most other researchers in the area, simply allows more time for rehearsal if Ss care to use it. Results of several studies in this laboratory suggest that they do.

Apparently the lack of first letter cues during recall hinders retrieval for Ss trained with cues. But this tells us little about their effects on storage, so the training trial data were evaluated for the confirmation conditions (obviously, prompting groups showed no error). Analysis showed the confirmation-cue group producing fewer errors than non-cue during the two three-trial blocks preceding Tests 1 and 2 but not Block 3. So storage was enhanced, at least over the early trials.

Explaining this result involves numerous problems of memory search and coding, only a few of which are noted here. There was a discrimination difference between training (cue) and test (non-cue) that complicated search; the first letter of the four or three letter chain was no longer presented as an eliciting stimulus. But after the initial test trials, Ss should have learned this fact and adjusted accordingly. Whether this occurred is difficult to determine from the data, although analyses showed no differential effects of cue vs non-cue over test trials. A more objective but tangential explanation is offered by the lack of significant difference between cue and non-cue groups in number of first letters correctly recalled during tests. Apparently the first letter cue was encoded as one unit with little overt repetition. The remaining letters of an item were encoded and stored as a separate more actively emphasized chunk. Examination of the data and post-experimental questioning strongly support this assumption. But other explanations are obvious as well as conjectural. Further clarification requires research utilizing cues in training, test, and both.

References

AIKEN, E. G., & LAU, A. W. Response prompting and response confirmation: A review of recent literature. *Psychol. Bull.*, 1967, 5, 330-341.

ARCHER, E. J. A re-evaluation of the meaningfulness of all possible CVC trigrams. *Psychol. Monogr.*, 1960, 74, (10, Whole No. 497), 1-23.

COOK, J. O. Supplementary report: Processes underlying learning a single paired-associate item. *J. exp. Psychol.*, 1958, 56, 455.

COOK, J. O., & KENDLER, T. S. A theoretical model to explain some paired-associate learning data. In G. Finch & F. Cameron (Eds.) *Symposium on Air Force human engineering, personnel, and training research.* Wash., D. C.: Nat. Acad. Sci.- Nat. Res. Coun., 1956, 90-98.

COOK, J. O., & SPITZER, M. E. Supplementary report: Prompting versus confirmation in paired-associate learning. *J. exp. Psychol.*, 1960, 59, 275-276.

GREENE, M., & SIDOWSKI, J. B. Effects of prompting and cueing upon short- and long-term retention of paired-associates. Paper presented at meetings of Western Psychol. Assoc., Los Angeles, 1963.

REYNOLDS, J. H. Paired-associate learning by anticipation and non-anticipation methods: Supplementary data. *Psychol. Rep.*, 1965, 16, 1123-1124.

REYNOLDS, J. H. Confirmation, contiguity, and response practice in paired-associate learning. *J. exp. Psychol.*, 1967, 73, 394-400.

SIDOWSKI, J. b., KOPSTEIN, F. F., & SHILLESTAD, I. J. Prompting and confirmation variables in verbal learning. *Psychol. Rep.*, 1961, 8, 401-406.

Note

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2. Now at American Institute of Research, Palo Alto.

3. Japanese phrase book. TM 30-641. Wash., D. C.: U. S. War Dept., 1942.

Response prompting: The practice time variable[1]

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Three experiments were designed to investigate the contributing effects of practice time to the reported superiority of response prompting over confirmation in paired-associate learning. With more adequate controls, the oft cited facilitating effects of prompting failed to materialize.

In a recent review of the response prompting literature, Aiken & Lau (1967) concluded that in paired-associate learning (1) prompting was equal or superior to confirmation, and (2) an emphasis on response-contingent events might be inefficient for modifying human behavior when avenues for direct verbal instruction were available. The purpose of this paper is to describe three experiments designed to test the effects of available practice time, a confounded variable favoring prompting that may have contributed to these effects.

The method of research basic to studies carried out in this area has been provided by Cook & Kendler (1956). In this and in subsequent experiments (e.g., Angell & Lumsdaine, 1960; Barch & Levine, 1967; Cook, 1958; Cook & Spitzer, 1964; Reynolds, 1967; Levine, 1965) the prompting design involved presentation of the stimulus and then the response (or S-R simultaneously), following which S wrote or called out the response term just presented. Although there may be slight variations in the method, no errors are made during training and retention is measured during interspersed test trials. Of course with classical confirmation, the stimulus is presented, S anticipates the response, and then the correct response term is shown (feedback). As a consequence, less time is available for practice before the stimulus for the next paired associate appears.

GENERAL METHOD

In each of three studies, Ss were instructed to learn 10 paired associates consisting of digit-nonsense syllable combinations. The list was composed by randomly assigning single digits (0-9) to each of 10 nonsense syllables, CVC trigrams of 25% association value (Archer, 1960). No two syllables began or ended with the same consonant.

All Ss received 12 trials, nine training and three test. During training Ss learned by the anticipation or prompting methods described below. Recall tests were given on Trials 4, 8, and 12, with only the stimulus term being shown and S required to write the response without feedback. Different random orders of the material were presented on each training and test trial.

The Ss were students from introductory psychology courses at San Diego State College who received class credit for serving. All were run individually, and assignment to conditions was random.

EXPERIMENT 1

Method

Eighty Ss were assigned to either a prompt or confirmation condition with an equal number of males and females in each. With prompting, the stimulus digit was shown, then the associated nonsense syllable, and then S wrote the response term just presented. In the confirmation condition, Ss saw the stimulus, anticipated and wrote the response, and then were shown the correct nonsense syllable. Each stimulus and response term was individually flashed onto a screen by a Dunning-filmstrip projector at a 2-sec rate; Ss were allowed 6 sec to respond. The interpair interval was 1 sec. On test trials, the stimulus was flashed for 2 sec and 6 sec allowed for recall. Responses were written on a paper tape that automatically advanced at the end of each trial.

Results

Analyses of variance on the number of correct responses showed significant superiority for prompting ($p < .01$) on each of the three test trials. This result is in general agreement with those reported by others using the basic Cook & Kendler (1956) design (Aiken & Lau, 1967; Angell & Lumsdaine, 1960; Cook, 1958; Cook & Spitzer, 1964; Levine, 1965).

EXPERIMENT 2

Method

Experiment 1 was replicated in all respects but one: The inter-pair interval was shortened for the prompt group from 1 to .5 sec and lengthened for the confirmation condition from 1 to 3 sec. This offered more available practice time to the latter group and shortened it for the former, although the advantage still favored prompting by 3.5 sec.

Eighty different Ss were randomly assigned to either a prompt or confirmation condition. Equal numbers of males and females served in each.

Results

Analyses of variance on the total number of correct responses showed no significant differences between experimental conditions on any of the three test trials.

EXPERIMENT 3

Method

The results of Experiment 2 suggested the need for a more detailed evaluation of the practice time variable. Therefore, in Experiment 3, 160 different Ss were randomly assigned to each of four experimental conditions. Three groups were subjected to the confirmation method and differed only in interpair interval times, 1, 3, and 7 sec, respectively. A fourth group used the prompting method with a 1-sec interpair interval. Thus, the prompt and confirmation 1-sec groups duplicated the conditions of Experiment 1 and offered a test of reliability. The 3-sec group replicated the time difference in Experiment 2, and the 7-sec condition offered one confirmation group the same amount of total practice time as was available to the prompt group, if the Ss cared to use it. In all other respects, the procedures for Experiments 1, 2, and 3 were alike.

Results

Separate analyses of the various combinations of conditions indicated that the prompt, 3-sec, and 7-sec confirmation treatments produced significantly more correct responses than the 1-sec confirmation group on all test trials ($p < .01$). However, prompt, 3-sec, and 7-sec confirmation groups were not significantly different from each other.

DISCUSSION

The results of Experiment 1 and the two equivalent groups of Experiment 3 indicate that prompting results in significantly more correct responses than confirmation when the classical Cook & Kendler (1956) design is used and all stimulus, response term, interpair, and overt response (anticipation) intervals equalized for the two conditions. However, we have noted that adherence to a "clean" design allows more practice time for the prompt groups. [Cooper & Pantle (1967) cite this as a distinction between nominal and effective practice times.] When this advantage is neutralized, confirmation groups fare just as well. Thus, statements concerning the superiority of prompting and the questionability of theory and method used in classical anticipation-type learning (Aiken & Lau, 1967; DeCecco, 1968) appear dubitable.

REFERENCES

AIKEN, E. G., & LAU, A. W. Response prompting and response confirmation: A review of recent literature. Psychological Bulletin, 1967, 68, 330-341.

ANGELL, D., & LUMSDAINE, A. A. Prompted plus unprompted trials versus prompted trials alone in paired associate learning. Report No. AIR-314-60-IR-129, 1960, American Institute for Research, Pittsburgh.

ARCHER, E. J. A re-evaluation of the meaningfulness of all possible CVC trigrams. Psychological Monographs, 1960, 74, No. 10 (Whole No. 497). Pp. 1-23.

BARCH, A. M., & LEVINE, J. R. Presentation method in auditory identification learning. Journal of Verbal Learning & Verbal Behavior, 1967, 6, 282-288.

COOK, J. O. Supplementary report: Processes underlying learning a single paired-associate item. Journal of Experimental Psychology, 1958, 56, 455.

COOK, J. O., & KENDLER, T. S. A theoretical model to explain some paired-associate learning data. In G. Finch and F. Cameron (Eds.), *Symposium on Air Force human engineering, personnel and training research.* (Publication No. 455) Washington, D. C.: National Research Council, 1956. Pp. 90-98.

COOK, J. O., & SPITZER, M. E. Supplementary report: Prompting versus confirmation in paired associate learning. Journal of Experimental Psychology, 1964, 67, 99-101.

COOPER, E. H., & PANTLE, A. J. The total time hypothesis in verbal learning. Psychological Bulletin, 1967, 68, 221-234.

DeCECCO, J. P. *The psychology of learning and instruction: Educational psychology.* Englewood Cliffs: Prentice Hall, 1968. Pp. 501-512.

LEVINE, J. M. Prompting and confirmation as a function of the familiarity of stimulus materials. Journal of Verbal Learning & Verbal Behavior, 1965, 4, 421-424.

REYNOLDS, J. H. Confirmation, contiguity, and response practice in paired-associate learning. Journal of Experimental Psychology, 1967, 73, 394-400.

NOTE

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2. Now at Regional Primate Research Center, University of Wisconsin, Madison, Wisconsin 53706.